

# Auditory affective agnosia<sup>1</sup>

## Disturbed comprehension of affective speech

K. M. HEILMAN, R. SCHOLÉS, AND R. T. WATSON

*From the University of Florida College of Medicine, Department of Neurology, and Veterans Administration Hospital, Gainesville, Florida, and the College of Arts and Science, Communication Sciences Laboratory, Department of Speech, Program in Linguistics, and Center for Neurological and Behavioral Linguistic Research, Gainesville, Florida, U.S.A.*

**SYNOPSIS** Hughlings Jackson noted that, although some aphasic patients were unable to use propositional speech, affective speech appeared to be spared. The purpose of this experiment was to study patients with unilateral hemispheric disease in order to ascertain if there are hemispheric asymmetries in the comprehension of affective speech. Six subjects had right temporoparietal lesions (left unilateral neglect) and six subjects had left temporoparietal lesions (fluent aphasia). These subjects were presented with 32 tape recorded sentences. In 16 trials the patients were asked to judge the emotional mood of the speaker (happy, sad, angry, indifferent) and in 16 trials the patients were asked to judge the content. Line drawings containing facial expressions of the four emotions or line drawings corresponding with the four basic contents were displayed with each sentence and the patient responded by pointing. All 12 subjects made perfect scores on the content portion of the test. On the emotional portion the right hemispheric patients scored a mean of 4.17 and the left hemispheric group scored a mean of 10.17. The difference between these means is significant ( $P < 0.01$ ) and suggests that patients with right hemispheric dysfunction and neglect have a defect in the comprehension of affective speech.

'The speechless patient may utter "yes" or "no" or both in different tones. . . . It is not a proposition but an interjection of a mere vehicle for variation of voice expressive of feeling.' Hughlings-Jackson (1879) noted that, although this aphasic patient was unable to use propositional speech, affective speech appeared to be spared. These patients demonstrated that affective speech and propositional speech probably have different brain mechanisms. Although there has been abundant research on the pathophysiological and pathoanatomical basis of propositional speech disorders, there has been little subsequent research into disorders of affective speech. The purpose of this experiment, therefore, was to study patients with unilateral hemispheric disease in order to ascertain if there are hemispheric asymmetries in the comprehension of the affective aspect of speech.

### METHODS

Subjects were 12 right-handed patients with temporoparietal lesions who were alert, oriented for time, place, and person, were cooperative and able to complete the tests. Six subjects had right hemispheric lesions and six had left hemispheric lesions. The anatomical site of the lesion was determined clinically (see Table). It has been demonstrated previously that patients with left unilateral neglect (inattention, extinction to simultaneous stimulation, hemispatial agnosia) have their lesion in the non-dominant temporoparietal region (Critchley, 1953; Heilman and Valenstein, 1972), whereas patients with fluent aphasia have their lesions in the left temporoparietal areas (Benson, 1967; Benson *et al.*, 1973). The six patients with left hemispheric disease had fluent aphasia. Five of the six had a conduction aphasia (fluent, paraphasic, good comprehension, poor repetition) (Benson *et al.*, 1973) and the other had an anomic aphasia with a Gerstmann's syndrome. The six patients with right hemispheric lesions all had the unilateral neglect syndrome.

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TABLE  
CLINICAL DETAILS

Subject	Age (yr)	Sex	Clinical picture	Lesion side	EEG abnormality	Scan	Aetiology	Correct responses	
								Emotional	Propositional
1	54	F	Anomia, aphasia, Gerstmann's syndrome	L	L parietal	L parietal	Glioma	10	16
2	37	F	Conduction aphasia	L	L temporoparietal	Normal	Embolic infarction	11	16
3	57	M	Conduction aphasia	L	L temporoparietal	L parietal	Infarction	9	16
4	60	F	Conduction aphasia	L	L frontoparietal	L parietal	Glioma	12	16
5	64	M	Conduction aphasia	L	L hemispheric	L parietal	Haematoma	9	16
6	55	M	Conduction aphasia	L	L temporoparietal	Normal	Infarction	10	16
7	56	M	Neglect	R	R temporoparietal		Infarction	4	16
8	64	M	Neglect	R	Hemispheric slowing	R fronto- parietal	Infarction	6	16
9	52	M	Neglect	R	R posterior	R parietal	Glioma	2	16
10	64	F	Neglect	R		Normal	Infarction	3	16
11	43	F	Neglect	R	R temporoparietal	R parietal	Focal encephalitis	4	16
12	54	M	Neglect	R	Hemispheric slowing	Normal	Infarction	6	16

Subjects were presented with 32 tape recorded sentences. The presentation was free field and the same tape, examiner, and recorder (Dictaphone 848) were used for all subjects. The subjects were asked to indicate either the content of the sentence or the emotional mood of the speaker. The subjects responded by pointing to one of a set of pictures which best corresponded with either the content or the emotion. In 16 of the trials the patients were asked to judge content and in the remaining the emotional mood. The four following sentences were employed: 'The man is showing the boys the dog food'; 'The man is showing the girls the bird seed'; 'The man is showing the boys the horseshoes'; 'The man is showing the girls the baby pictures'. Line drawings corresponding in content with each of these sentences were made and were randomly arranged on 16 sheets of 20.3 × 28 cm (8½ × 11 in) paper. When the subject was asked to judge content, he was presented with the tape recording of one of the above four sentences and shown one of the arrangements of pictures and asked to point to the picture which best corresponded in meaning with the particular setting.

Each of the above four sentences was read in one of the four following emotional moods: angry, happy, sad, indifferent. Line drawings of faces which corresponded with each of these four moods were made and randomly arranged on 16 sheets of 20.3 × 28 cm (8½ × 11 in) paper. When a subject was asked to judge emotion he was presented with a tape recording of one of the sentences and asked to point to the face and to state aloud the emotion which best

corresponded with the emotional mood of the person reading the sentence on the tape recorder.

Each of the 16 different stimuli (four different contents × four different emotions) was presented twice and on one of the presentations the subject was required to judge emotion and on the other presentation he was asked to judge content. The order of presentations of these 32 trials was randomized. Before and after the 32 trials all the subjects were tested to ascertain if they had difficulty with picture recognition—for example, point to the happy face, the sad face. . . . In addition, before the 32 experimental trials all the patients were given an example of four sentences, each with a different emotional mood—for example, 'The man who is saying this is sad'.

## RESULTS

Mean age for the right hemispheric group was 55.5 years, standard deviation (SD) 7.9 and for the left hemispheric group 54.5 years (SD 9.3). Using Student's *t* test, the difference between the means is not significant (*t* = 0.200 with 10 d.f.). Using Fisher's exact test, there were no significant differences between sexes (*P* = 0.49). Before and after the 32 trials, when asked to point to the face which represented each of the moods, none of neglect or aphasic patients made any errors. Although the aphasic patients would occasionally use words like 'mad' for angry and 'don't care'

for indifference, in both groups there were no discrepancies between the face the patient pointed to and the patient's spoken response.

All 12 subjects made perfect scores (mean 16) on the content portion of the test. On the emotional portion of the test, the patients with right hemispheric dysfunction scored a mean of 4.17 (SD 1.99). This was not significantly different from chance. The aphasic group had a mean score of 10.17 (SD 1.17). This was significantly better than chance and the difference between the right and left hemispheric group was significant ( $t=6.904$  with 10 d.f.,  $P<0.01$ ).

#### DISCUSSION

It is clear from these experiments that patients with right hemispheric dysfunction and neglect have a defect in the comprehension of the affective aspect of speech. It is not clear, however, why they have this defect.

Patients with right tempoparietal dysfunction frequently have facial agnosia (Critchley, 1953), however, because the patients were tested for and did not demonstrate facial agnosia (as required for the task), this cannot be the explanation for their defect. In addition, if facial agnosia were the explanation of the defect, one would expect these patients to have had a discrepancy between their verbal response and their pointing response. There were no discrepancies.

Although patients with neglect may be inattentive to one side, the stimuli were given free field and, if they were neglecting the left half of the response sheets, one would again have expected them to have spoken-pointing discrepancies. In addition, if neglect of the answer sheet were responsible for their poor performance, these patients should have demonstrated the same defect to the content portion of the test and they did not. Therefore, inattention to the left side could not account completely for the defect seen in these patients.

Paul (1909) recognized that the language of affect depended on modulation of pitch, tempo, inflection, and stress. There have been several case reports of patients who lost musical ability because of right hemispheric lesions. However, most of these have had vocal expression and instrumental amusia (Wertheim, 1969).

Spreen *et al.* (1965) described a right-handed

patient who was not aphasic but had difficulty with non-linguistic sound recognition (meaningful non-language sounds, and a questionable amusia). Nielsen (1939) also described a similar case. Both patients had the neglect and both had right hemispheric dysfunction. Faglioni *et al.* (1969) compared patients with right and left hemispheric dysfunction by giving them meaningful and meaningless sounds. The patients with right hemispheric dysfunction did poorly on the meaningless sound tests, whereas patients with aphasia and left hemispheric disease did poorly on the meaningful sound test—for example, dog barks. This led the authors to believe that the right hemisphere auditory function is perceptual-discriminative, while that of the left hemisphere is associative-semantic.

Milner (1962) studied the effects of temporal lobectomy on musical discrimination by giving these patients the Seashore Measure of Musical Talents. The Seashore Measure has subtests which test pitch, loudness, rhythm, time, timbre, discrimination, and tonal memory. When the scores of the patients with left temporal lobectomy were compared with those with right temporal lobectomy, the latter group had more difficulty with these tests, timbre and tonal memory being the most impaired. Kimura (1967) simultaneously presented melodies to both ears and found that the left ear did better than the right, giving further support to Milner's observations that certain nonlinguistic auditory discriminations are processed by the right hemisphere.

Unfortunately, Milner, Spreen, Nielson, and Faglioni's patients were not tested for auditory affective agnosia and our patients were not tested for musical ability and for sound recognition. Therefore, the relationship between auditory discriminative function and auditory affective agnosia remains uncertain.

An alternative hypothesis, however, is that the defect is not one of auditory discrimination, but rather one of affect. Denny-Brown *et al.* (1952) studied patients with neglect from parietal lesions and noted that these patients were indifferent. Gainotti (1972) studied 160 cases of unilateral cerebral lesions and demonstrated that, although patients with left hemispheric disease frequently have a catastrophic reaction ('anxiety, tears'), patients with right hemispheric

disease have indifferent reactions. Gainotti's data would suggest that right hemispheric disease causes more than a defect in discrimination. It is of interest to note, however, that most patients with the indifference reaction had neglect. It is appropriate that patients with aphasia are depressed and tearful. However, it is surprising that a patient with left hemiplegia is not depressed. They may not be depressed because they are neglecting their paresis. Gainotti's data support the hypothesis that the indifference reaction is related to the presence of neglect. He feels, however, that neglect is neither a necessary nor exclusive feature of the indifference reaction. He therefore feels that the right hemisphere is important in mediating emotional processes.

Support for Gainotti's hypothesis comes from Wechsler's study (1972) which showed that there was a relationship between the laterality of a lesion and the ability to recall emotionally charged verbally presented material, the non-dominant right hemisphere seemingly playing the dominant role.

Although it appears that lesions in the right hemisphere are important in the production of auditory affective agnosia, the mechanism of affective agnosia remains uncertain.

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